



The following icons describe which articles would be of particular interest to teachers, administrators, or both audiences.

**T**

*Articles for Teachers*

**A**

*Articles for  
Administrators*

**T/A**

*Articles for Both  
Audiences*

**Summer, 2002**

## **Cover Story**

### **Indoor Air Quality** **A**

Find out what kinds of indoor air quality issues can arise when undertaking a renovation project on your school grounds and learn how to avoid them.

## **Bug of the Month**

### **Flies** **A**

Learn how you can implement "Integrated Pest Management" strategies on your school grounds to eliminate pests like flies and mosquitoes.

### **Lesson Plan: IPM For Teachers** **T**

Use this lesson plan and activity guide to teach your young students about "Integrated Pest Management."

## Dear Lori

Environmental Q&A with Lori Kaplan, Commissioner of the Indiana Department of Environmental Management.

## Disposal Dilemmas

### **IDEM and the Indiana Household Hazardous Waste Task Force “Clean Sweep” Schools**

Learn how these groups worked together to help schools clean out their chemistry labs and how your school can take part.

## Burning Question

### **Should I be concerned about pesticide use on the school grounds?**

Learn how to apply the techniques of Integrated Pest Management during routine turf and landscape management practices on your school grounds.

## Money Matters

### **Energy Efficiency Loans through the Indiana Department of Commerce**

Check out this zero-percent interest loan program for school remodeling projects.

## Health Corner

### **Ozone Dos and Don'ts**

Read what you, your staff, and students should know about ground-level ozone.

### **Lesson Plan: Indoor Air Quality**

Take a look at this short activity designed to help you talk to your young students about ozone safety.

## Super School

### **Scottsburg High School**

This quarter's “Super School” promotes environmental stewardship through innovative outdoor programs and active student involvement initiatives.

# Recycling Bin

## Environmental Curricula

Check out these exciting environmental curricula to spice up your science class for a day, or an entire school year!

# Cover Story:

## Avoiding Indoor Air Problems- Planning a Renovation Project

By: Tami Johnson

If your school is planning a renovation or demolition project, there are several indoor air quality issues to think about including construction fumes and dust, asbestos fibers, mold, project design, and off-gassing from building materials and new products. Here are some simple tips to minimize indoor air quality problems during the different stages of the project.

### 1. Planning the Project

In the planning stages of the project, negotiate contract language which contains instructions for the contractors to use the least toxic materials during the renovation. Work practices should ensure indoor air quality is not compromised in the project. Contractors should also be willing to work during unoccupied periods during the school year. Contract specifications should reflect the use of isolation techniques, including barriers and negative pressure, ventilation and filtration requirements and proper housekeeping and material storage.

- Provide advance notice and information about the project to all school occupants and parents. During longer projects, periodic updates should be given to keep the school community informed.
- Plan to isolate or temporarily relocate students and staff from any dust or fumes generated during renovation work.
- Assign someone from the school to oversee that the specifications are being met to minimize occupant exposure.

### 2. During the Project

#### General

- Use plastic sheeting, portable fans, and a mechanical ventilation strategy to prevent dust and fumes from reaching school occupants through hallways, doors, windows, and the ventilation system.
- Increase housekeeping practices, not only in the renovation area, but also in the rest of the school.
- Give attention to workers and equipment leaving renovation areas to avoid carrying dust and fibers to other parts of the school. Ensure that walk-off mats and removable coveralls are used and equipment is wiped down before exiting the work area.
- Do not disturb asbestos during demolition or renovation. Schools that have asbestos-containing materials, as identified in an Asbestos Hazard Emergency Response Act (AHERA) survey, should have a management plan when considering whether planned renovations will require disturbing areas containing asbestos. Use an asbestos professional to consult on and assist with such renovation work. Be sure to update the AHERA management plan to reflect any asbestos abatement activities.

- Follow US EPA National Emission Standards for Hazardous Air Pollutants rules of disposal of asbestos-containing materials.
- Minimize and provide for off-gassing from new products. New products contain volatile organic constituents, such as resins, solvents, and binders, which off-gas volatile organic compounds for a period of time. Whenever new products with the potential for off-gassing are installed, allow adequate time for off-gassing before re-occupying the area and increase ventilation with outdoor air until off-gassing and any irritation symptoms no longer occur.

## **Painting**

- Check for lead-based paint before removing old paint, especially if the paint is older than 1978. Use a licensed inspector for testing areas to be demolished, sanded, or stripped.
- Use appropriate personnel and precautions when removing and disposing of lead-based paint. Special care should be taken when preparing a surface for painting, due to the dust released into the air. The dust may contain lead particles.
- Never sand lead based paint. Always wet scrape the area instead of sanding. Exposure to excessive levels of lead could affect a child's mental growth and interfere with nervous system development which could cause learning disabilities and impaired hearing. In adults, lead can increase blood pressure.
- Select a low-volatile organic compound (VOC) emitting paint. Both solvent-based and water-based paints give off VOCs that could lead to indoor air quality problems. Water-based paints produce less VOCs than solvent-based paints, but produce them over a longer period of time.
- Schedule exterior and interior painting to occur when the building is unoccupied, like weekends or vacation periods. Allow time for paint odors to dissipate before occupants return to the area.
- Use exhaust and supply ventilation to sweep fumes out of the building.
- Block ventilation return openings to prevent circulating air from the work area to other areas of the building.
- Use proper storage and disposal practices for paints, solvents, and supplies. Keep container lids sealed when not in use.

## **Flooring**

- Determine whether resilient tile flooring scheduled for removal contains asbestos fibers. Renovation may/will disturb asbestos-containing flooring.
- Select low-emitting adhesives when installing glue-down flooring.
- Do not install carpet near water sources.
- Air out new products before installation.
- Avoid re-circulating air from the installation area through the heating, ventilation, and air conditioning system and into occupied areas. Seal return air grilles, open doorways, stairways, and use exhaust fans to remove airborne contaminants.
- Follow the manufacturers' recommendations for ventilating the work area space during and after flooring.

## **Roofing Jobs**

- Keep "hot pots" of tar and other pollutant-producing materials away from outdoor air intakes.
- Consider wind patterns at the work site and arrange equipment so prevailing winds carry odors away from the building.
- Temporarily close the outdoor air intakes of air handlers, particularly rooftop units in the vicinity of and downwind from the work area. To avoid creating IAQ problems from under-ventilation, provide a temporary means like fans and/or ducts to supply unaffected outdoor air, and reduce pollutant-generating activities indoors.

### **3. End of the Project**

- Do a thorough cleaning, including the wet wiping of surfaces and vacuuming with a high efficiency vacuum for fine or potentially toxic dusts, such as asbestos, lead or mold.
- Clean building system components, including those in the ventilation system, which have been contaminated during the work. This includes the disposal and replacement of filters.
- Balance and test the ventilation system if it has been modified, or if areas served by the ventilation system have been altered.

## Bug of the Month: Flies

By: Chris Gautier

The average person can recognize a fly when they see one. But, did you know that 120,000 different kinds of flies such as fruit flies, drain flies, filth flies, fungus gnats, and cluster flies have been identified worldwide? Entomologists, scientists who study insects, believe that one million different species may exist, but have not yet been identified. Flies, like most insects, have been around a long time. The oldest fossilized specimens are 240 million years old. That's 10 million years before the first dinosaurs!

Fly species include, but are not limited to deer flies, crane flies, house flies, hover flies, fruit flies and mosquitoes. They are a commonly seen insect, and play an important role, both as a pest and as a beneficial insect. Some flies pollinate flowers, allowing plants to reproduce. Many fly species eat organic waste which helps nutrients to cycle in nature. Flies, including their eggs or larva, are an important food source for other organisms, as any angler can tell you.

On the other hand, flies and mosquitoes can be very harmful pests to humans. Fruit flies can decimate agricultural crops, flies can be disease vectors, and mosquitoes can be a biting nuisance.

Many types of flies cause problems in school-buildings. Integrative Pest Management (IPM) techniques involve mostly non-chemical intervention solutions. It is possible to control your pest without using a heavy pesticide regimen.

### Here's what you can do:

- Identify and get rid of breeding sites.

The key to getting rid of flies indoors is eliminating places where they can lay eggs – called breeding sites. Flies typically breed in the following types of places: moist organic matter, potting soil, animal waste, sewers, sump pumps, unused urinals, sink overflows, floor drains, sour mops, compost, recycling bins, trash cans and fermenting organic material.

Mosquitoes breed from spring to the first fall frost. Populations are most dense during late summer and fall and are, therefore, more of a nuisance to schools in the beginning of the school year. Eliminating sources of standing water will effectively reduce mosquito populations around schools. If control is not possible, then heavily infested areas must be avoided. Personal protection against mosquitoes and other biting flies includes the use of repellents and proper clothing to protect exposed skin.

- Clean regularly.

Basic sanitation is key to getting rid of a fly breeding site. Regular upkeep of the problem area will be necessary. For example, trash dumpsters or tires and other outdoor containers can collect water if not emptied regularly. Also, designate a food trash container and make sure it is emptied daily.

- Exclude flies and mosquitoes

Make sure all doors are self-closing, install screens on windows, and mend screens as needed to keep flies and mosquitoes out of a building. Pesticide use will kill adults, but will not get rid of the problem. With the larva or maggots still developing in the breeding site, the fly or mosquito problem simply will recur within a few days. Getting rid of the breeding site is of paramount importance.

For specific reduction and elimination information, please contact IDEM at 1-800-451-6027 and ask for extension 3-5628. You can also refer to the Purdue IPM Web site at [www.entm.purdue.edu/entomolgy/outreach/schoolipm](http://www.entm.purdue.edu/entomolgy/outreach/schoolipm) or call 1-877-668-8476.

## Lesson Plan: IPM For Teachers

### Introduction

*Although it is important for everyone, it is especially important for children to have a clean and healthy **environment**, both indoors and out.*

First of all, children drink more water, eat more food, and breathe more air for their body size than adults do, which makes them more likely to be exposed to **pollutants**. Also, children's bodies and organs are still growing. Any damage that is done to them can affect them for the rest of their lives.

IDEM works to reduce children's exposure to various environmental threats such as lead, mercury, asbestos, mold, pesticides, and other asthma irritants.

### B. Integrated Pest Management: Introducing Insects and Pests

*Although an insect can be a pest, not all pests are insects.*

**Insects** have six legs and a body made of three parts: the head, the thorax, and the abdomen. Some insects have wings and some don't. Scientists believe that there are more than 900,000 different kinds of insects in the world. Some of these insects are helpful to people are some can cause a lot of problems. Insects live in many different types of places and do different things, but they all need three important things to live: food, water, and shelter.

**Pests** are animals, insects, or plants that bother people. For example the weeds in the lawn, and rats scurrying around garbage cans are pests. People spend a lot of money on getting rid of pests each year.

### C. Integrated Pest Management: Indoors v. Outdoors

*Pests can live inside or outside. It is important to know where different kinds of pests live so that we can get rid of them without using dangerous chemicals.*

Bugs belong outside, where they are supposed to live and be useful as food for other bugs or animals. However, bugs sometimes want to live inside of people's homes, where they can cause illnesses and steal and spoil food. They can make messes in our homes that cause kids to get sick with **allergies** and asthma. This is why bugs need to stay outside.

*Cockroaches are one type of pest that tries to live in our homes.*

**Cockroaches** are insects because they have a head, an abdomen, and a thorax but they are pests too, because when they try to live inside they cause a lot of problems. Cockroaches come in many shapes and sizes called species. In our country there are four common species and one of them, the German cockroach can be a really big problem because it spreads diseases. The other species are bad too though, because they leave flakes of their skin wherever they go. They also leave droppings on the food that they eat. If cockroaches live inside our homes and there is food that is not put away the roaches will sneak out while you are sleeping and leave saliva, skin flakes, and droppings all over it. Scientists call this stuff **frass**.

Frass can cause big problems for people because not only does it make our homes dirty, it can induce asthma, which is a serious health problem and can make children very sick. Asthma is an illness that causes the lungs to tighten up. Breathing becomes so difficult at times that hospital treatment is necessary. Children can suffer from asthma because the frass that the cockroaches leave irritates their lungs and makes them close up.

## The Principles of Integrated Pest Management (IPM)

*IDEM has a program called Integrated Pest Management, or IPM, that works to get rid of pests in a way that is both safe for the environment and effective.*

IPM uses non-chemical and chemical methods to get rid of pests. The five principles of IPM are:

- ✧ **Exclusion:** Keep pests out by sealing cracks and crevices.

Look for little spaces under the doors, windows, and walls, where roaches can sneak into your house or apartment. Roaches can fit through spaces as small as a dime, so make sure the spaces are filled with caulking putty and the gaps under the doors are closed off with weather strips.

- ✧ **Sanitation:** Keep our homes and buildings clean on a regular basis.

Clean out areas where the roaches could be living. Crumbs should be cleaned up immediately, or roaches can follow them and infest the entire house. Wipe up spilled water and keep the faucets turned off. Roaches are good swimmers, and even one drop of water can satisfy a thirsty roach.

- ✧ **Monitoring:** Be aware of whether or not pests are present.

Roaches like to hide in dark places like in corners and under heavy things like refrigerators. Food bits can fall into these places and give the roaches both a place to live and food to eat. Food must also be stored where roaches cannot get to it.

- ✧ **Treatment:** Select a treatment method for the particular pest that is least hazardous and most effective.

The first three steps should be enough to make your bug count start dropping, but if more help is needed a roach trap would be a good purchase. These traps catch roaches and get rid of them. **Baits** can also be used in cracks and crevices to get rid of the bugs. However, only adults should use chemicals at home.

- ✧ **Evaluation:** Evaluate how well treatment worked and keep records of sanitation and/or chemical intervention.

Make sure you keep track of when you last treated your home for pests, how you took care of them, and what (if any) chemicals were used.

## Activity #1

### Build-A-Bug/Hide-A-Bug activity, and activity for the entire class.

Purpose: To teach students the basic parts of a bug body, where bugs like to hide indoors, and how to safely get rid of them.

Materials: Build-a-bug templates, scissors, pipe cleaners, scotch tape

Instructions: Using the “build-a-bug” template have students assemble the cockroach body by tracing it onto the brown shopping sack and cutting it out. (Use pre-cut bug bodies for younger students). Next, use pipe cleaners to make legs and antennae for the bugs. Older students can poke these through, bending them in half for a roach that stands on its own. Younger students may need to have their pipe cleaners cut in half and taped to the bodies.

After the bugs have been built, split the classroom into two groups. One group becomes the pest control technicians while the other group hides their roaches. Have the pest control technicians wait outside the room while the other group hides their roaches. When all the children involved have hidden their roaches, call the pest control group back in to search for them. If time allows you may reverse the roles and repeat the activity.

Discussion/Follow-up: When building the roaches, make sure you re-emphasize the body parts of the insect body and what makes it an insect. While searching for the roaches, remind the students of where they like to hide and why. Also, when a student finds a roach discuss with the class what safe ways there are to get rid of roaches that hide in spots like



Dear Lori

**Dear Lori: As a teacher in a school with a tight budget, I am constantly seeking informative yet inexpensive ways to continue my own professional growth. Does IDEM offer any training opportunities?**

Yes, we do! We are proud to offer an annual Environmental Education Workshop for teachers, educators and administrators. This year's one-day event, titled "Mercury in Schools and Environmental Resource Workshop," will be held Thursday, October 24 at the Indiana Government Conference Center in Indianapolis. The workshop is free of charge.

We understand that Hoosier teachers appreciate one-stop shopping for state environmental education resources, as well as curricula and hands-on science projects for your classrooms. In addition to offering updates on Indiana State Science Standards, Integrated Pest Management practices for schools, and many great educational resources, this year's workshop will provide valuable information on the important issue of mercury in Indiana schools and how to properly manage it.

IDEM also offers teacher in-service and "train the trainer" workshops on Project LEAP, our Indiana-specific, hands-on air pollution curriculum. Project LEAP was designed specifically for Indiana educators and students. Look for us at the next HASTI Conference or call to find out when a workshop will be hosted near you! For more information or to register, please contact Chad Trinkle at 1-800-451-6027, extension 3-9479.

**Dear Lori: I enjoy teaching my students about science using other disciplines. Are there any current issues that naturally fit into other subjects, such as history or social studies?**

This year marks the 30<sup>th</sup> anniversary of the Clean Water Act, a landmark in environmental protection. This anniversary provides an opportunity to educate students on the history of environmental legislation, the importance of environmental stewardship, and the variety of professions involved in protecting our nation's water resources.

A great source of information pertaining to the "Year of Clean Water" can be found at [www.yearofcleanwater.org](http://www.yearofcleanwater.org). At this site, you will find a listing of nation-wide events scheduled in celebration of the anniversary; the history of the Clean Water Act; information on educational tools such as publications, videos and posters; and details on the October 18 celebration of "National Water Monitoring Day." I encourage you and your colleagues to use this milestone to celebrate the Clean Water Act, while educating your students on the history of this environmental movement in the United States.



For more information on Indiana's Year of Clean Water activities, please contact Karen Terrell at 1-800-451-6027, extension 3-6648.

## IDEM and the Indiana Household Hazardous Waste Task Force help “Clean Sweep” Indiana schools

By: Chad Trinkle

With funding from the U.S. Environmental Protection Agency (US EPA), the Indiana Department of Environmental Management (IDEM) and the Indiana Household Hazardous Waste Task Force (IHHWTF) have assisted eight schools who agreed to be part of a pilot program called “Clean Sweeps.” The program was designed to remove unwanted, unstable, and unused chemicals from their science laboratories. Over 1200 bottles of various chemicals were removed from the respective schools.

All Indiana middle and high schools participating in IDEM's Mercury Reduction and Recycling Pledge Program for Schools (See the Notepad, Issue 1, Disposal Dilemmas) were eligible to participate in the Clean Sweeps Program. Eight schools received the free inventory services and had earmarked chemicals packed, transported, and recycled or disposed of for free.

IDEM chemists and voluntary compliance officers, along with the IHHWTF Project Director, visited the schools during the summer of 2001 to go through their respective chemical stockrooms and earmark chemicals to be removed by the contractor or simply disposed of on-site. Chemicals not targeted for removal were then reorganized to help the teacher establish a more efficient storage system. Teachers were also left with information of how to do common experiments with less hazardous materials and smaller quantities while achieving the same desired educational results.

Participating schools were given other logistical and maintenance-oriented suggestions, such as purchasing a new flammable cabinet that is built out of a material such as steel, installing smoke detectors and fire extinguishers, consolidating chemicals, having Material Safety Data Sheets and chemical inventories readily available, installing lips on the shelves or obtaining doors with locking mechanisms, and ensuring that the chemical storage room has its own ventilation system.

A second round of “Clean Sweeps” will take place this summer for 16 new schools. The only requirement for participation is that the school be a member of good-standing in IDEM's Mercury Reduction and Recycling Pledge Program for Schools and has had all mercury and mercury-containing items removed from their campus. Take the opportunity this summer to make your school mercury free, clean out your chemical closets, and offer your fellow staff and students a safer, healthier environment in which to work and learn next fall.



## Integrated Pest Management on the Outside: Turf and Landscape Management

By: Tami Johnson

Integrated Pest Management (IPM) is an approach for treating pests based on pest biology using non-chemical approaches and the judicious use of pesticides that are safe to the environment and children. IDEM has worked with Purdue and Indiana Universities to develop model IPM pilot programs for schools and child care facilities. This process focuses on indoor mechanical and sanitation controls to keep pests from entering buildings in the first place.

However, adequate attention should also be focused on outdoor procedures as it is more likely for a pesticide application to be made there. A key difference between indoor and outdoor IPM involves managing a non-living environment (the building) versus managing a living environment (turf and landscape plantings). In both cases, the environment should be managed in a way that will make it hard for pests to survive. In an outdoor setting, the most important strategy for reducing pests such as weeds, insects, and vertebrates, is to maintain healthy, vigorous plants. Thus, a large part of outdoor pest management is really “plant management.”

Follow these steps when trying to develop an IPM outdoor turf and landscape management plan:

### **Step 1: Designate an Outdoor IPM Program Coordinator.**

The coordinator will develop the management plans for school grounds and communicate with administrators, staff and community any maintenance activities. These include pesticide applications made in accordance with the school's pest management policy and any applicable regulations.

### **Step 2: Develop a Site-Specific Management Plan for each area.**

Different areas of the school grounds require different levels of management. For example, athletic fields generally require a higher level of maintenance than turf around the school entrance. For more on designating management areas, see University of Wisconsin's School IPM Manual [link to: [http://ipcm.wisc.edu/programs/school/section\\_2/designating.htm](http://ipcm.wisc.edu/programs/school/section_2/designating.htm)].

When developing the management plan for each area, keep in mind that the risk of pesticide exposure can be reduced while still maintaining the appearance of the area by implementing the following measures:

- Establish realistic pest tolerance levels. Pesticide use in some areas around the school may be reduced or eliminated by determining that a few pests can be tolerated.
- Use good management practices. Pesticide use in some areas may be reduced or eliminated by employing management practices such as regular fertilization, irrigation, or

- raised mowing height, that can increase plant health and reduce the potential for pest infestation.
- Consider non-chemical control options. Examples include hand-weeding, using weed-whackers, utilizing biological control options for some insect pests, and water management for some turf diseases.
  - Reduce pesticide use in some areas by spot-treating for weeds, diseases, or insects instead of using a broadcast application.
  - Eliminate preventive pesticide treatments and begin a pest monitoring program.
  - If a pesticide is needed, reduce exposure by applying it when the area is not in use, such as during weekends or school vacations. Also, notify and communicate to the appropriate staff and community members when the application will be made and when it will be safe to re-enter the area.

### **Step 3: Establish a Monitoring/Record Keeping System.**

Many potential pest problems can be detected before critical damage occurs simply by making observations throughout the year. Time constraints may limit the ability to maintain detailed records of plant health and pest occurrences, but even making basic, regular observations during routine maintenance activities can be very helpful.

### **Step 4: Identify Pest Problems.**

When pest problems occur, pest identification is the first critical step to resolving the problem. Work with a trained pest management professional or Purdue Cooperative Extension agent to identify pests with which you are not familiar. Understanding the pest's life cycle will allow for optimal selection and timing of treatment.

The Illinois Department of Natural Resources and the University of Illinois have prepared an [Online Identification and Management Guide](#) for turf and landscape pests.

### **Step 5: Review Treatment Options and Apply Treatment.**

Non-chemical control options should be considered and used wherever practical prior to any pesticide application. For a summary of treatment options available and some considerations in making management decisions, see the US EPA's IPM for Schools: A How-To Manual (on the internet at <http://www.epa.gov/region09/toxic/pest/school/chap-4.pdf>.)

### **Step 6: Post and Notify.**

Use signage at the site of a pesticide application to let people know that an area has been treated. The purpose of the sign is keep people from entering an area that has been treated with pesticides until it is safe to do so. Notification is the practice of providing advanced notice of planned pesticide applications to members of the school community.

### **Step 7: Evaluate the IPM Program.**

As with any management system, routine re-evaluation of the outdoor IPM program is essential to assure that the program is achieving its goals. Comparing data on pest infestation levels such as the number of pests before and after some management practice can help to evaluate the effectiveness of specific control measures.



**For more information:**

For further information on school IPM or a schedule of upcoming workshops, contact the school IPM hotline at 1-877-668-8IPM or visit [www.entm.purdue.edu/entomology/outreach/schoolipm](http://www.entm.purdue.edu/entomology/outreach/schoolipm).

## Energy Efficiency Loans through the Indiana Department of Commerce

By: Alysia Gard

Are you remodeling your school, retrofitting lights or working on the Heating, Ventilation and Air Conditioning (HVAC) system? Then you should consider a zero-percent interest Public Facility Energy Efficiency Program (PFEET) loan from the Energy Policy Division, Indiana Department of Commerce. PFEET loans are provided to help Indiana public schools, libraries and political subdivisions become more energy efficient, thus creating better learning and working environments, conserving Indiana's energy resources, and helping to save money on utility bills.

Inefficient equipment that creates pollution and wastes scarce dollars on high utility bills can be upgraded or replaced. Money saved on energy resources is money that can be spent on educational resources or additional building upgrades. Loan recipients can also save energy by making simple changes in building operations and maintenance and by teaching building users ways to use energy more efficiently.

To qualify, the investment must have a payback period of ten years or less. Loans are available through the program for up to \$100,000 at a zero-percent (zero %) interest rate. No matching funds are required by the applicant, but funds must be drawn down within one year of contract ratification. Loans are awarded competitively based on evaluation criteria. These criteria include the project's energy savings, the amount of pollution prevention anticipated as a result of the project, practicality and technical feasibility of the project, and the applicant's need for assistance. For more information about this program, please contact Gavin Williams at the Indiana Department of Commerce by email at [gwilliams@commerce.state.in.us](mailto:gwilliams@commerce.state.in.us) or by phone at 317-232-8979.

## Health Corner: Ozone Dos and Don'ts

By: Chris Gautier and Courtney Kasinger

"Good up high, bad nearby." This saying about ozone serves to remind us that ozone plays a dual role in our lives. Here's how.

Ozone high in the atmosphere and at ground level is the same molecule, a triangular arrangement of three oxygen molecules. The ozone in the uppermost portion of the atmosphere traps most of the sun's skin-damaging ultra-violet rays, but ozone located within the first seven to ten miles of our atmosphere can contribute to air pollution and health problems.

High levels of ozone can pose significant health risks to the elderly, young children and people with pre-existing lung ailments, but even healthy adults may be affected. Ozone is a very reactive molecule which attacks lung tissue and contributes significantly to the loss of lung function in certain people. This can translate into shortness of breath, asthma, chest pain, coughing, nausea, and congestion. Repeated exposure may cause permanent damage to lung tissue. Ground-level ozone can also damage vegetation, buildings and monuments.

Ground-level ozone is formed when nitrogen oxides (NOx) and volatile organic compounds (VOCs) are "cooked" in the hot summer sun. NOx and VOCs are emitted from automobiles, lawn mowers, water recreation vehicles, gasoline fumes, some industry operations and other combustible engines.

An OZONE ACTION DAY means that a combination of high temperatures, strong sunlight, calm winds and air pollutants are expected to produce high concentrations of ozone at ground-level. Prolonged exposure to ground-level ozone can cause health problems including irritation to the respiratory tract, which could cause coughing and difficulty in breathing. Children, senior citizens and adults who are sensitive to respiratory problems are especially susceptible to the effects of ozone. Even healthy adults may experience these symptoms.

So what can we do to help? Here are some tips everyone can follow to reduce their contribution to the formation of ground-level ozone:

- Carpool, walk, bike or use public transportation when possible.
- Avoid excess idling and fast starts if you must drive.
- Avoid drive through windows and consolidate trips to reduce driving.
- Postpone mowing your lawn until late evening.
- Avoid using gasoline powered garden equipment.
- Postpone chores that require the use of oil-based paints, solvents or varnishes.
- Conserve energy in your home to reduce energy needs from power plants.



You may check your local newspaper, call 1-800-631-2871, or check the IDEM "Smog Watch" Web site at [www.IN.gov/idem/air/smog](http://www.IN.gov/idem/air/smog) to find out if an Ozone Action Day has been announced for your area.

## Lesson Plan: Indoor Air Quality

**Another problem that can affect children is indoor air quality.**

We usually think of air pollution as being outdoors, but indoor air quality can actually be as much as 2 to 5 times more polluted than outdoor air. People in our country spend almost 90% of their time indoors, breathing indoor air. Because our houses and schools are enclosed spaces the air becomes more stagnant and the pollutants become denser. There are many types of pollutants that can get into our indoor air, including pesticides, solvents from paint, mold, and dust. Some pollutants come in from outside sources such as idling car engines and nearby factories. Other pollutants come from our air ducts. No matter where they come from, these pollutants can make us sick.

### **Symptoms and Solutions to Indoor Air Quality Problems**

*Indoor air pollutants affect us in many ways.*

Adverse health effects include rashes, sinus problems, congestion, asthma, coughing, sneezing, and headaches. Health problems vary depending on the person and on the type of pollutant. One group of people that are affected more, however, are children. Because children breathe in more air, weight for weight, than adults do air pollutants and their health affects are amplified for children.

#### Activity #2

##### Lung Puppets, an activity for the entire class.

Purpose: To help students understand that some things in the air can be bad for people and some things in the air do no harm to our breathing.

Materials: Lung Puppet template, scissors, crayons, tape

Instructions: Using lung puppet template, have students cut out lung puppets along the dotted line, fold them into lung shape and taped closed. They may color the good lung pink and the bad lung brown if time permits. Have students place the good lung on one hand and the bad lung on the other when finished. Now call out five or six things from the "good" and "bad" lists (see Appendix A), and ask the students to raise the appropriate puppet into the air as each one is mentioned.

Discussion/Follow-up: Discuss how important it is for us to breathe properly. Explain that there are good and bad things for the air, and that the bad ones can make kids sick. Help them to understand the difference between the things that are bad and those that aren't.

*There are many ways in which we can reduce indoor air pollutants, as well.*

Some solutions are as simple as being more careful and making a few lifestyle changes. Do not let the car idle in the garage next to the house, for example. Another way to get rid of some pollutants is to choose non-toxic cleaning products and chemicals to use indoors. Mold can be caused by too much humidity. By fixing these problems, as well as making mechanical adjustments to our ventilation system, we can cut down our indoor air pollutants considerably

## Scottsburg High School's Outdoor Lab

By: Shari James, Scottsburg High School Biology Teacher

On any given day, an observer might see students at Scottsburg High School working in the outdoor lab site helping to develop an area where students from many disciplines can study in an outdoor setting. Over the past five years, students have developed a wetlands area, pond, amphitheater, and a butterfly/hummingbird garden as part of the outdoor lab. Student generated projects have provided much needed "seed money" to fund the start-up costs associated with the different aspects of the lab. Some of these projects included helping to write grants.

Some of the grants and contributions obtained include the Indiana Department of Education Economic Education Grant, the U.S. Department of Agriculture's Global Change Environmental Education Initiative Grant, Scottsburg Wal-Mart, Seymour Wal-Mart Distribution Center, Muscatatuck National Wildlife Refuge, the Scott County Soil and Water Conservation District, the Scottsburg Beautification Committee, and the Scottsburg Farm Bureau. Many local businesses and Scottsburg High School's senior class have also contributed money, materials, and equipment. Scottsburg's mayor has even donated his talents by using a backhoe to dig out the pond and wetlands area!

Scottsburg High School is located 30 miles north of Louisville, Kentucky and has an enrollment of 671 students. The area used to develop the outdoor lab was merely a basin that held water during times of flooding. This area was reconfigured to provide a wildlife habitat and outdoor learning lab. Many projects have evolved using this outdoor site and have included student participation from different disciplines such as Biology, Agricultural Science, Chemistry, art, building and trades, English, Spanish, and middle school science.

Ken McMichael and Shari James are the principal directors of the Scottsburg High School outdoor lab. They are spearheading the continual development of this outdoor habitat, while other teachers and community members have also contributed their expertise.

One of the unique activities associated with the outdoor lab that has received a lot of publicity and enthusiasm involves high school Biology students working with middle school science students. Shari James, a high school Biology teacher, and Bill James, a middle school science teacher, have students participating in the Monarch Watch Program. Affiliated with the University of Kansas, Monarch Watch involves a network of students, teachers, volunteers, and researchers dedicated to the study of the Monarch butterfly and its spectacular fall migration to Mexico. This migration is considered an "endangered phenomena" because scientists fear this incredible journey may not last beyond the next decade, mainly because of habitat destruction.

Students raise, tag, and release the Monarchs, but the project has grown in scope to also include the following aspects:

- 1) Students established a "butterfly/hummingbird" garden in the outdoor lab.
- 2) Students did active research on the mating behavior of the Monarch

- 3) Students presented the Scottsburg Monarch Watch Program at the Indiana Environmental Summit.
- 4) Students made and sold butterfly/hummingbird kits to homeowners of Scott County.
- 5) Students sent “symbolic” Monarchs to students in Mexico.
- 6) Students, along with Mrs. James, studied Monarch research in Minnesota with Texas Monarch experts, Karen Oberhausen and Bill Calvert.

Another spin-off from the outdoor lab has been the students' participation in Project LEAP, a science-research-based program sponsored by the Indiana Department of Environmental Management. Students and members of the community have been very excited about what the outdoor lab has provided for Scottsburg, an outdoor science education program for the school and community. This project is definitely a work in progress and one that just keeps getting better.

## Recycling Bin – Environmental Curricula

IDEM believes that a sound environmental curriculum is essential to the success of educating students on the importance of recycling, source reduction, composting, and buying recycled. While we can not endorse a particular curriculum, we are pleased to provide some examples from which you can choose. Please contact the individual organization to obtain more information about the respective curriculum. Check out these exciting environmental curricula to spice up your science class for a day, or an entire school year!

### **Heritage Education Foundation, Inc.**

Environmental Curriculum Kits

Contact: Kristina Simmonds, 317-972-8568

#### *Sky Tree, Grades K-8*

Explore the environment from the perspective of both artists and scientists as your students learn to appreciate the beauty of trees and their importance to the environment. The Sky Tree portfolio comes with a teacher's guide.

#### *From Trimmings to Treasure, Grades K-3, 4-6, Middle School*

Composting, the cycle of decomposition to composition, focuses on soil science through hands-on activities incorporating math, social studies, and other areas. Each grade cluster comes with a supplemental kit which includes a video and children's literature to compliment the curriculum.

#### *Home Safe Home, Grades K-8*

This interdisciplinary curriculum examines the use of chemical products in and around our homes and proper disposal. Students will participate in several activities guided by teacher tips for classroom enrichment. The curriculum also comes with a supplemental kit with books and resources.

### **Indiana Department of Environmental Management**

Project LEAP

Contact: Chad Trinkle, 800-451-6027 or 317-233-9479

#### *Learning and Environmental Awareness Partnership*

Project LEAP provides interdisciplinary, environmentally focused text, materials, activities, and scientific investigation projects to Indiana students and educators. The

program focuses on the development of a student's concepts about the causes of pollution and how pollution affects human health as well as local and global ecosystems.

All Project LEAP curriculum includes a breakdown of targeted skills and concepts so that educators know how it fulfills Indiana's Performance Based Accreditation requirements for meeting curriculum proficiencies.

Project LEAP's goal is to help educators create better environmental stewards. Educators are provided free tools that have been developed to enable them to play a critical role in teaching environmental education. Free workshops or classroom presentations can also be arranged.

### **Michigan United Conservation Club**

Great Lakes WISE Project

Contact: Lisa Ashby, 219-769-3820 (Lake County Solid Waste Management District)

#### *Waste Information Series for Education*

The WISE Project is a K-12 environmental education curriculum focusing on solid waste and pollution prevention with the goal of affecting behavioral change in students towards pollution prevention and resource recovery.

Containing nearly 300 pages full of activities, plus a comprehensive introduction and resource section of educators, the WISE Project incorporates hands-on environmental education into the classroom, teaches responsible solid waste management and pollution prevention, and meets core curriculum standards.

### **Ohio DNR Division of Recycling and Litter Prevention**

Windows on Waste

Contact: Kelly Armfelt, 614-265-6358

#### *Reaching the Next Generation: Youth Recycling and Waste Reduction Programs*

Windows on Waste is a hands-on, minds-on activity guidebook, developed by the Ohio Department of Natural Resources. It can be used to explore specific subjects and learning outcomes or to create a thematic, interdisciplinary issues-based approach to teaching and learning.

The 14 "Windows on Waste," each representing a separate lesson in the guidebook, are based on 14 environmental studies learning concepts and a specific concept about solid waste and recycling.

Use this curriculum to: engage students in real world issues about the environment by emphasizing solid waste issues, recycling, and litter prevention; Promote learner-centered education by using environmental inquiries and community action opportunities; and help make the environment a better place by promoting student involvement at home, school, and your neighborhoods.

## **Sargent-Welch**

GEMS Kits

Contact: Belinda Fox, 800.727.4368

Sargent-Welch National Sales Manager, Curriculum Products

<http://www.sargentwelch.com>

### *Great Explorations in Math and Science*

Developed at the Lawrence Hall of Science at the University of California, Berkley, GEMS teachers guides and handbooks contain activities for pre-school through 10<sup>th</sup> grade. GEMS kits come complete with all the necessary materials.

- *Ladybugs*

This is a nice, early introduction to household hazardous materials where children learn about natural alternatives to these potentially dangerous materials and the important role the ladybug can play.

- *Sifting Through Science*

Students investigate the properties of different natural resources in learning station situations. Then each student is given a “mini-landfill” and challenged to separate the garbage using the knowledge and tools they’ve practiced in the previous activities.

- *Treasure Boxes*

Students learn to sort and classify, an essential component to successful recycling. This guide also encourages cooperation, sharing, and an appreciation for the many ways we can recycle and reuse materials.

- *Oobleck: What do scientists do?*



Students investigate and analyze the properties of a strange green substance as discussion arise about what should and should not go into a landfill.